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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/635,606	08/10/2000	John C. Kralik	6536-118	7149

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EXAMINER	
DUONG, THOI V	

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/635,606	KRALIK, JOHN C.	
	Examiner	Art Unit	
	Thoi V Duong	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-24* ~~is~~/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-24* ~~is~~/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the Amendment filed August 05, 2004.

Accordingly, claims 1, 4, 14 and 15 were amended, and claims 3 and 25 were cancelled. Currently, claims 1, 2 and 4-24 are pending in this application.

Response to Arguments

2. Applicant's arguments with respect to claims 1, 2 and 4-24 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 4-6 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al. (USPN 5,625,473) in view of Obikawa et al. (USPN 5,200,110).

Re claims 1 and 14, Kondo et al. discloses a method of fabricating a diffractive or non-dispersive polymer dispersed liquid crystal electrooptic device, comprising the steps of:

providing a nematic liquid crystal (col. 19, lines 49-55);

providing a photo-curable pre-polymer mixture (col. 19, lines 25-47);

mixing said nematic liquid crystal with said photo-curable pre-polymer mixture to form a homogeneous nematic/pre-polymer mixture with said nematic liquid crystal being

greater than 40% (by weight) of said combined homogeneous mixture (col. 9, lines 26-33 and col. 20, lines 29-42);

providing a cell comprising a pair of spaced apart transparent substrates 34, 36 that are each coated with a transparent conductive layer 33, 35, without the inclusion of an alignment layer for aligning said nematic liquid crystal as shown in Fig. 8 (col. 9, lines 6-25);

filling said cell with said homogeneous nematic/pre-polymer mixture (col. 9, lines 18-21); and

photo-curing said nematic/pre-polymer mixture using a spatially inhomogeneous illumination source (col. 9, lines 34-42); and

utilizing the above fabricating method to create said diffractive or non-dispersive electrooptic device in the form of a polymer dispersed liquid crystal (PDLC) exhibiting low scattering loss and high index modulation (col. 1, lines 54-65 and col. 20, lines 17-28).

Re claims 4 and 15, said substrates are separated approximately 5.5 micrometers by spacers having a particle size of 5.5 micrometers (col. 9, lines 15-20).

Re claim 5, said PDLC is comprised of a dispersion of discrete droplets containing nematic liquid crystal-rich material 38 in a polymer-rich matrix 37 (Fig. 8).

Re claims 6 and 17, said PDLC is comprised of regions of inter-connected spaces that are filled with nematic liquid crystal-rich material 38 (Fig. 8).

Kondo et al. discloses a liquid crystal electrooptic device that is basically the same as that recited in claims 1 and 14 except for providing a nematic liquid crystal in the form of a eutectic mixture.

Obikawa et al. discloses a nematic liquid crystal in the form of eutectic mixture (col. 2, lines 9-17),

wherein, re claim 2, said nematic liquid crystal possesses a large positive dielectric anisotropy (col. 3, lines 15-18).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Kondo et al. with the teaching of Obikawa et al. by employing a nematic liquid crystal in the form of a eutectic mixture so as to obtain a liquid crystal electrooptic device having a wide temperature range and requiring a low driving voltage (col. 2, lines 48-50).

5. Claims 7-9 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al. (USPN 5,625,473) in view of Obikawa et al. (USPN 5,200,110) as applied to claims 1, 2, 4-6, and 14-17 above and further in view of Sumiyoshi et al. (USPN 6,278,506 B1).

Kondo et al. in view of Obikawa et al. discloses a method of fabricating a diffractive or non-dispersive polymer dispersed liquid crystal electrooptic device that is basically the same as that recited in claims 7-9 and 18-20 except for the step of deriving said spatially inhomogeneous illumination source used to photo-cure the nematic/pre-polymer mixture from the interference of two coherent optical beams within said cell.

Re claims 7 and 18, as shown in Figs. 5A-5C, Sumiyoshi et al. discloses a method of fabricating a liquid crystal cell (Fig. 5A) comprising the step of deriving a spatially inhomogeneous illumination source 16 used to photo-cure a nematic/pre-polymer mixture 15a (col. 11, lines 40-45) from the interference of coherent optical beams LB11 and LB12 within the cell (col. 6, lines 30-51) to produce a plurality of phase gratings for increasing the intensity of transmission light (col. 7, lines 52-56).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the method of fabricating a diffractive or non-dispersive polymer dispersed liquid crystal electrooptic device of Kondo et al. with the teaching of Sumiyoshi et al. by employing two interfering optical beams which are incident symmetrically about a direction normal to said cell in order to form said PDLC as an unslanted PDLC transmission grating so as to produce a highly bright image for the display (col. 7, lines 52-56).

Re claims 8 and 19, it is obvious that the coherent optical beams each have a wavelength in the ultraviolet spectrum for radiating the photo-curable polymer.

Re claims 9 and 20, Fig. 18 shows the incident angle AGL1 and the azimuth angle AGL2 of the beams wherein AGL1 of the beam LB12 is fixed to zero by regulating the reflecting mirrors 16d and 16e while the beam LB11 is incident with a certain incident angle AGL1 to produce a first multilayer structure for the mixture. Further, a second multilayer structure is created in the mixture by changing the reflecting mirror 16c in such a manner as to maintain the incident angle AGL1 and changing the incident azimuth AGL2 by 180 degrees for the beam LB11. Accordingly, an unslanted PDLC

transmission grating will result when the interfering optical beams LB11 are incident symmetrically about a direction normal to said cell (col. 10, lines 15-48). Also, as shown in Fig. 8, Sumiyoshi et al. discloses that the nematic liquid crystal in the nematic-rich regions in the PDLC contains a high degree of orientational order and has its nematic director substantially aligned along a uniform orientation OR2 in a grating layer 15f when no drive field is applied across said cell. Since the grating layer is unslanted, its grating vector is parallel to the grating surface.

6. Claims 10-13 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al. (USPN 5,625,473) in view of Obikawa et al. (USPN 5,200,110) and Sumiyoshi et al. (USPN 6,278,506 B1) as applied to claims 7-9 and 18-20 above and further in view of Popovich et al. (USPN 6,339,486 B1).

The diffractive or non-dispersive polymer dispersed liquid crystal electrooptic device of Kondo et al. as modified in view of Obikawa et al. and Sumiyoshi et al. above includes all that is recited in claims 10-13 and 21-24 except for a grating period that is greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during use of said transmission grating and a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrical tunable birefringence.

As shown in Fig. 13, Popovich et al. discloses a transmission grating 200 having periodic planes of polymer planes 200a and PDFC plane 200b wherein each polymer plane has a thickness t(P) and each PDLC plane has a thickness t(PDLC), and the combined thickness of the PDLC plane and the polymer plane is a grating period which

is less than an incident optical wavelength to exhibit form birefringence (col. 15, lines 1-4 and col. 17, lines 1-10). Accordingly, the grating period can be selected to be greater than half the wavelength of the light to be diffracted by the PDFC transmission grating during use of said transmission grating. Popovich et al. also discloses the transmission grating with a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrically tunable birefringence (col. 9, line 64 through col. 10, lines 7; and col. 15, lines 1-15). Similarily, Popovich et al. discloses that a high birefringent static sub-wavelength wave-plate can also be formed.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the device of Kondo et al. with the teaching of Popovich et al. by forming the unslanted PDLC transmission grating with a grating period that is greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during use of said transmission grating or a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrically tunable birefringence or a retarder so as to improve the display brightness (col. 9, line 64 through col. 10, lines 7; and col. 15, lines 1-15).

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thoi V. Duong whose telephone number is (571) 272-2292. The examiner can normally be reached on Monday-Friday from 8:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim, can be reached at (571) 272-2293.

Thoi Duong

10/21/2004

TARIFUR R. CHOWDHURY
PRIMARY EXAMINER